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| Derby Diocesan Association of Church Bellringers Consultant's Report | Report no. DDACB 01/004 |
| Inspection of New Six Bell Installation at Saint James, Bonsall | Issue date: 8/04/04 |

1.0 Introduction

The purpose of this report is to establish the acceptability of the new installation so that various grants may be paid to the PCC.

After lying derelict for about 100 years, the old six bell installation has been replaced by a modern six bell installation. The old third and sixth bells have been retained and the ring made up to six by the addition of a new treble, second, fourth, and fifth bells. The old fifth bell is now hung dead above the new frame and will become the hour bell for the tower clock. Ringing is from the ground floor.

John McCartney (DAC Bells Adviser), Robin Lyon (Bells Consultant to the DDA) and myself, Mike Banks (Bells Consultant to the DDA), carried out the initial inspection on 1 April 2004 with a final inspection carried out on 8 April 2004. The installation has been judged to be acceptable.

2.0 Bell frame

A galvanised steel frame complete with new fittings has replaced the old wooden frame. There is plenty of space below and above the frame for maintenance work, however access to the underneath requires care.

The frame is of compact but robust construction and competently installed.

3.0 Bells

Details of the bells are as follows.

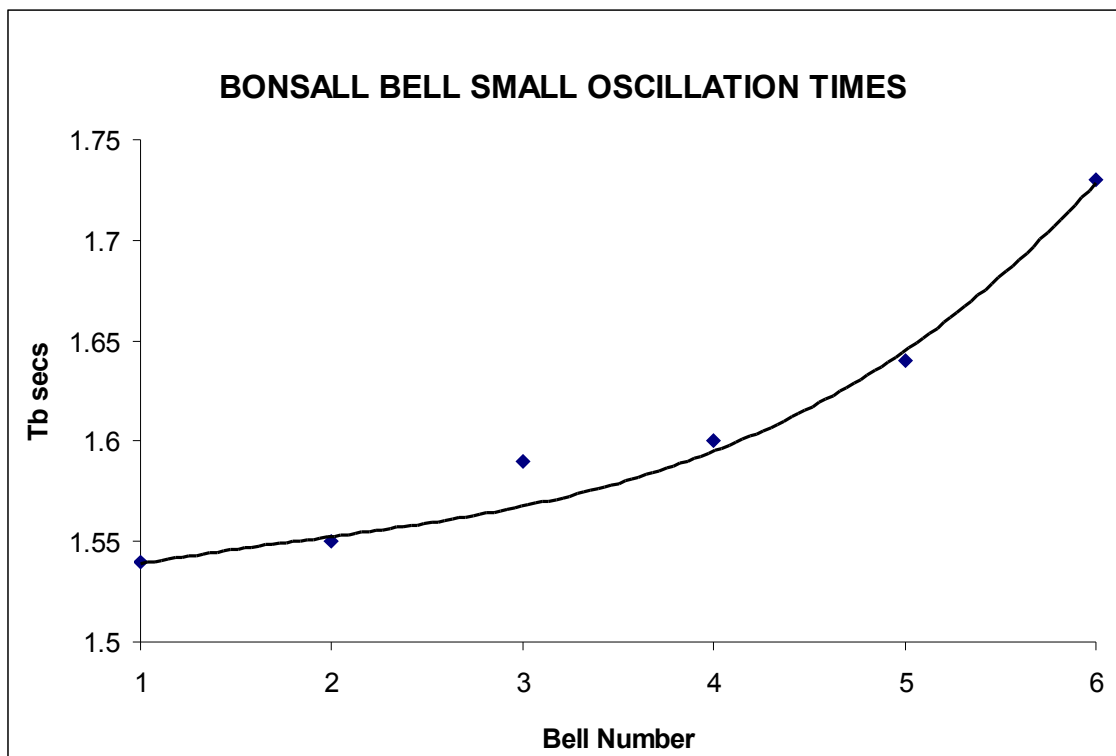
| BELL | Approx Weight kgs (lbs) | Diameter mm (ins) | Date | Founder |
|-------------|------------------------------------|------------------------------|-------------|------------------|
| 1 | 130 (286) | 570 (22.4) | 2003 | Eijsbouts |
| 2 | 149 (328) | 610 (24.0) | 2003 | Eijsbouts |
| 3 | 191 (420) | 680 (26.75) | 1656 | George Oldfield |
| 4 | 230 (507) | 700 (27.6) | 2003 | Eijsbouts |
| 5 | 260 (573) | 758 (29.8) | 2003 | Eijsbouts |
| 6 | 385 (848) | 890 (35) | 1731 | Immanuel Halton? |

The canons have been retained on the old bells and a resin pad cast around the base of the canons to facilitate mounting in the new cast iron headstocks. A resin layer has also been cast inside the crown of these bells providing a flat surface for the independent crown staple to pull up against.

The swing times over a small arc were measured by timing each bell over 20 small oscillations. Three sets of readings were taken for each bell and an average time/oscillation derived. The results are shown below.

| BELL | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------------------------|------|------|------|------|------|------|
| Time/oscillation Tb secs | 1.54 | 1.55 | 1.60 | 1.60 | 1.64 | 1.73 |

For ease of striking it is necessary for the oscillation times for each bell to lie on a smooth curve. It can be seen from the graph that bells 1,2,4,5 and 6 meet this requirement. Bell 3 is slow by about 1.3% from ideal which is outside the preferred tolerance of +/- 1%. Additional "pull down" testing was carried out on Bell 3 to establish the position of its centre of gravity and the value of its radius of gyration. This bell retains its canons and appears to have been hung with its centre of gravity displaced from its axis of rotation by a distance very close to the value of its radius of gyration. Under these conditions it is not possible to usefully speed the bell up any more by altering its hang and so it must be accepted.



4.0 Clappers

The swing times over a small arc were measured by timing each clapper over 20 small oscillations. Three sets of readings were taken for each clapper and an average time/oscillation derived. The results are shown in the table below.

| BELL | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------------------------|----------|----------|----------|----------|----------|----------|
| Time/oscillation Tc secs | 1.30 | 1.31 | 1.36 | 1.38 | 1.40 | 1.50 |
| Tc/Tb | 0.84 | 0.85 | 0.86 | 0.86 | 0.85 | 0.87 |

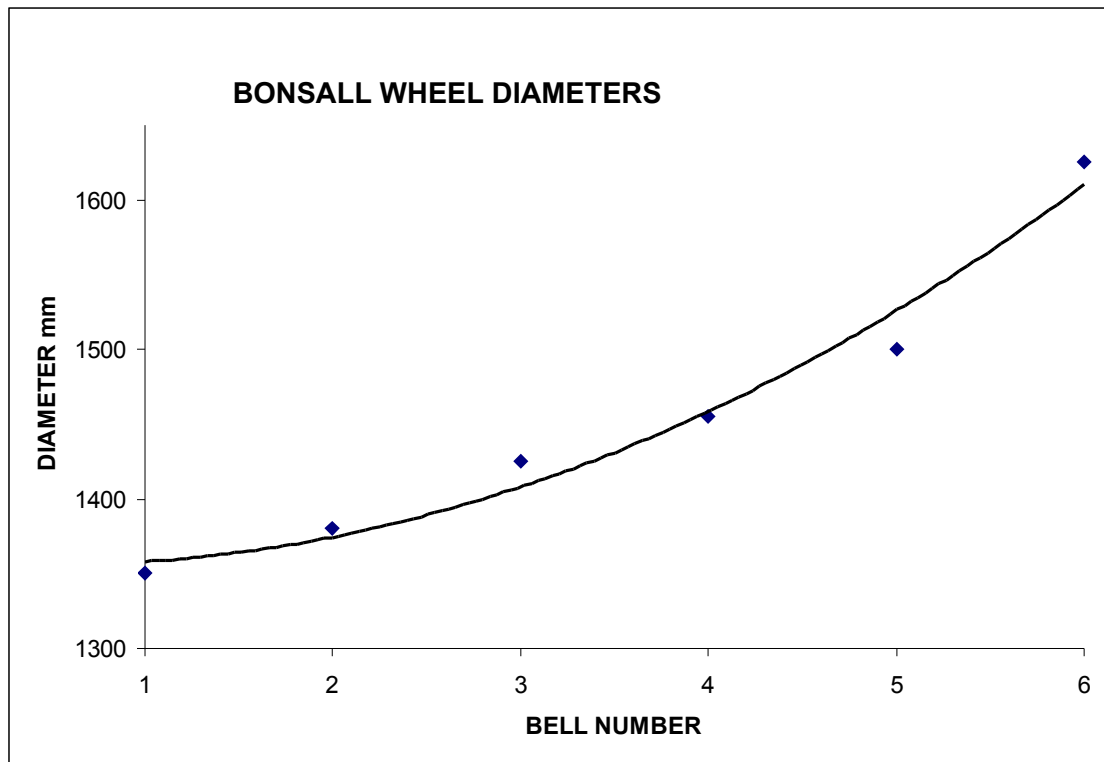
Experience has shown that values of Tc/Tb of 0.85 – 0.9 are satisfactory and result in acceptable clapping of the bell. This is certainly true for the Bonsall bells.

5.0 Wheels

The overall wheel diameters were measured as follows.

| BELL | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------------|----------|----------|----------|----------|----------|----------|
| Wheel Diameter mm | 1350 | 1380 | 1425 | 1455 | 1500 | 1625 |

Referring to the graph it can be seen that the diameters fall more or less on a smooth curve which is acceptable.



6.0 Sound Levels

Sound levels were measured both inside the ringing room and outside at the main entrance to the church yard where most neighbouring houses were located. The sound level meter was set to SLOW with an “A” weighting and results are shown below.

| BELL | 1 | 2 | 3 | 4 | 5 | 6 |
|------------------------|-------------|-------------|-------------|-------------|-------------|---------|
| Ringling Room dBA | 64H/62 B | 65H/65 B | 64H/62 B | 68H/64 B | 66H/68 B | 65H/65B |
| dBA at Churchyard Gate | 63H/62 B | 64H/64 B | 68H/67 B | 72H/70 B | 70H/69 B | 67H/68B |

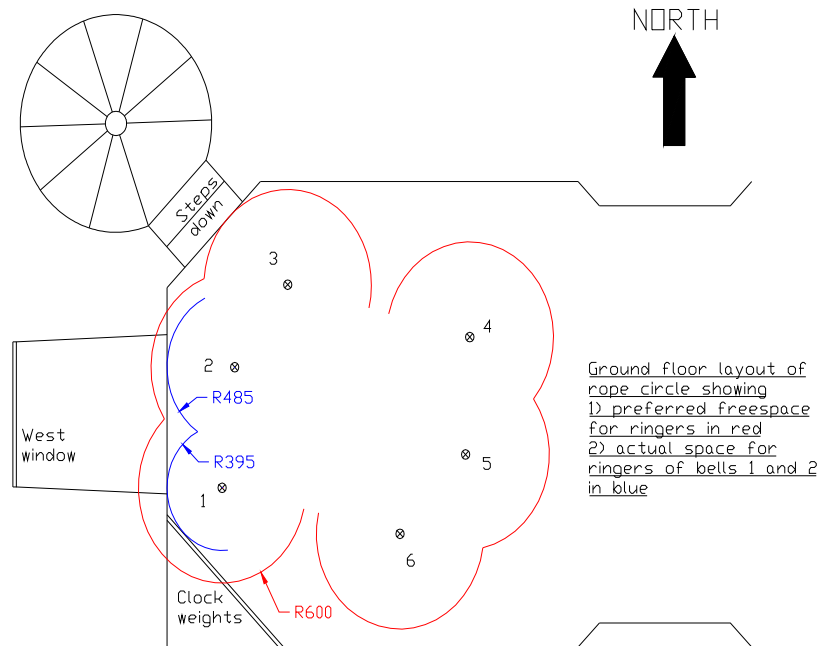
The ideal sound levels in the ringing room would lie in the range 68 – 72 dBA which allows both the bells and verbal instructions to be clearly heard. The Bonsall results lie between 62 – 68 dBA and so are quieter than preferred. Since this is a ground floor ring open to the nave, additional sound from the congregation during service ringing will make audibility of the bells more difficult. Leaving the ground floor tower door open made no difference to the sound levels. If sound levels become a problem then further experiments should be carried out, perhaps with the bell chamber trap doors partially open and or both upper and lower tower doors left open.

Sound levels measured outside the church at the main entrance gate were not at a level which should cause undue distress to the neighbouring population.

7.0 Ringing Circle

Referring to the drawing below, the ropes fall in an acceptable circle. However free space available behind the ringers of bells 1 and 2 is limited, particularly 1. Space is required to enable ringers to handle the ropes in a way which allows the rope to fall vertically in front of the ringer and which avoids interference with adjacent ringers. Adequate space is particularly important for inexperienced ringers since there must also be room for a tutor. The preferred free envelope around a ringer falls within a circle of 600 mm radius and this is shown in red in the drawing. The blue arcs show the actual clearance from the west wall which, at 485 and 395 mm, is well within 600 mm. A simple alteration to the tower clock case would have made it possible to move the treble rope further away from the west wall. Also if autowind is ever fitted to the clock in the future this would enable space currently occupied by the weight box to be relinquished to the treble ringer.

The local ringing band find they can ring these two bells without too much trouble and so for this reason the rope positions are accepted.



8.0 Conclusions / Recommendations

The bell installation is accepted and it is recommended that any outstanding grants be paid to the PCC.

Note. Information given in this report is given free of charge and in good faith but no liability can be accepted.

Mike Banks B Eng C Eng MIMechE

Bell Consultant to the Derby Diocesan Association of Church Bellringers